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EXAMINER

KIELIN, ERIK J

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 07/29/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/042,358

Applicant(s)

ONG ET AL.

Examiner

Erik Kielin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 May 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-10,22,25,27 and 36-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-7,9,10,22,25 and 27 is/are rejected.
- 7) ☐ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This action responds to the amendments filed 1 April 2003 (Paper No. 9) and 29 May 2003 (Paper No. 12).

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 5, 6, 9, 10, 22, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5,347,144 (**Garnier et al.**).

Regarding independent claim 1, **Garnier** discloses an electronic device (a thin film transistor or TFT), comprising a substrate, gate electrode (called “conducting grid”), gate dielectric, and source/drain electrodes (col. 2, lines 20-29; col. 6, lines 19-47) and a semiconductor layer comprising a polythiophene derived from monomer segments shown in col. 4, line 35 to col. 5, line 21, labeled as formula “(III).” **Garnier** discloses the polythiophene of formula (III) shown in col. 4, to have the following substituent groups:

X and X' independently represent O, S, Se, Te, or --N(R)--,

R represents H, alkyl, substituted alkyl, aryl, or substituted aryl;

R₁, R₂, R'₁, R'₂, R'₃, and R''₃ each independently represent --H, Cl, F, or a --CF₃, --NO₂, --CN, --COOR₃ group, --N(R₄)(R₅), alkyl, substituted alkyl, aryl, substituted aryl, alkoxy or polyalkoxy,

R₃ represents an alkyl or substituted alkyl group or a metal,

R₄ represents H or an alkyl or substituted alkyl group,

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R_3 represents an alkyl, acyl, or aryl group or R_1 and R_2 and/or R'_1 and R'_2 pairs together represent a divalent hydrocarbon group which may be unsaturated or possibly interrupted and/or terminated by at least one heteroatom,

Y , Y_1 , Y_2 , and Y_3 independently represent the following groups: $--C(R')=C(R'')--$ $--C\equiv C--$ $--N(R')--$ $--N=N--$ $--C(R')=N--$ $--N=C(R')--$, wherein R' and R'' independently represent $--H$, alkyl, substituted alkyl, aryl, or substituted aryl,

a , b , a' , b' are numbers equal to 0 or 1, or Y_1 may also represent a cyclic or heterocyclic arylene group, and in this case $b=1$ and $a'=0$,

s and t are whole numbers, including zero, of which at least one is different from zero,

m' is a whole number equal to at least 1, the numbers s , t , and m' are such that

$$m'(s+t)=m,$$

m being a whole number between 4 and 24.

In the oligomer with formula III, units A and A' can alternate regularly or not. In addition, in a given oligomer, the substituents and/or heteroatoms of the units can be different.

In the instant case, monomers A and A' in **Garnier** are the equivalent of the instantly claimed R_m -substituted and unsubstituted thiophene monomers of the instantly claimed formula (I). The sidechains R_1 , R_2 , R'_1 , R'_2 , in **Garnier** are equivalent to the instant sidechain R_m , because any of R_1 , R_2 , R'_1 , R'_2 may be hydrogen or the non-hydrogen substituents, as indicated above. Any of Y to Y_3 in **Garnier** corresponds to the A monomer of the instant formula (I). Only one of the subscripted Y 's or Y is required since a , a' , b , and b' may be zero.

Regarding claims 5 and 6, R (one of R_1 , R_2 , R'_1 , R'_2 , in **Garnier**) may be alkyl containing from about 6 carbon atoms to about 12 (instant claim 5) or 4 to 12 carbons (instant claim 6) because "alkyl" is defined as the hydrocarbon groups. The remaining substituents may be hydrogen.

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Regarding claims 9 and 10, as noted above, D (one of Y to Y₃ in Garnier) “Y₁ may also represent a cyclic or heterocyclic arylene group” as noted above in the excerpt from Garnier. Garnier shows a cyclic arylene group which is phenylene (col. 3, line 38). Accordingly, D (one of Y to Y₃ in Garnier) may be, *inter alia*, phenylene, which has 6 carbons.

Regarding claim 22, the instant n corresponds to the Garnier m' which, as noted in the excerpt above may be 4 to 24 which overlaps 5 to 5000.

Regarding claim 25, as noted above with regard to claims 5 and 6, the instant R of formula (I) may be alkyl in the Garnier formula and therefore anticipates the presently claimed alkyl groups and m=1 corresponds to, for example, R₁ of Garnier being the alkyl group and the other R₂, R'₁, and R'₂ substituents are hydrogen. The instantly claimed x=y=2 corresponds to the Garnier s and t which are indicated to be a whole number greater than zero. Instant z is claimed to be 0 or 1 which as noted with regard to claims 9 and 10 above may be 0 or 1.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Garnier** in view of US Patent Application Publication 2002/0053666 A1 (**Marks et al.**).

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Garnier does not teach that the sidechains of the thiophene monomers may be perfluoroalkyl having from 2 to 15 carbons.

Marks teaches the benefits of using perfluoroalkyl sidechains from 4 to 12 carbons (paragraph [0057]) on thiophene units in the production of polythiophene semiconductor materials to adjust the electron affinity and improve stability and volatility (Abstract).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to make the alkyl sidechains of **Garnier**, perfluoroalkyl sidechains of 4 to 12 carbons, as taught by **Marks**, to achieve the benefits of improved stability and volatility and to be able to adjust the electron affinity.

5. Claims 1, 3, 4, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 97/32914 (**Möhwald et al.**) considered with **Garnier**.

Regarding claim 1, **Möhwald** discloses a polythiophene having both substituted thiophene and unsubstituted thiophene units. (See paragraph bridging pp. 8-9 --especially formulas VII and VIII.) In the instant case, $z = 0$, such that no A monomer is present.

While **Möhwald** does not specifically indicate that the polythiophene is in an electronic device, he does indicate that the polythiophene has electrical conductivity and may be used as a semiconductor and is for industrial use. (See p. 5, line 20 to p. 6, line 13.)

Garnier, as noted above teaches the use of polythiophenes as a semiconductor in a thin film transistor (an electronic device).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the polythiophene of **Möhwald** as the semiconductor layer in an electronic device because

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Garnier teaches that polythiophenes may be used as the semiconductor active layer in a TFT and because **Möhwald** teaches that the polythiophenes have used as semiconductors and are for industrial use.

Regarding claims 3 and 27, **Möhwald** discloses that the instant n (I in Möhwald) is 1 to 3000 (p. 9, lines 3-6) and the weight average molecular weight (M_w) is 1000 to 500,000 (with other indicated preferable ranges) and that the number average molecular weight (M_n) is $\frac{1}{2}$ to $\frac{1}{4}$ M_w , which is 250 to 125,000. Each is as measured by gel permeation chromatography using polystyrene standards. (See p. 16, lines 14-22.)

Regarding claim 4, R (X and/or Y in Möhwald) may be alkyl of 1 to 20 carbons (p. 6, lines 19-29) and the M_n and M_w are as indicated above.

(Note: US Patent 6,242,561 B1 (**Möhwald** et al.) is based upon the WO publication above.)

Allowable Subject Matter

6. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claims 36-38 are allowed.

8. The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not teach or suggest, in combination with the other claimed limitations, an electronic device having the polythiophene of the formula (I) of claim 1 wherein the Replace sidechain is a siloxyalkyl of trimethylsiloxyalkyl or triethylsiloxyalkyl.

Response to Arguments

Applicant's arguments filed 1 April 2003 (Paper No. 9) have been fully considered but they are not persuasive.

On page 5, section entitled "Paragraph 7," Applicant requested that Examiner provide basis in statute or rule for requiring that the title reflect the claimed invention. Examiner refers Applicant to MPEP § 606, from which Examiner gains instruction for the requirement. Examiner thanks Applicant on behalf of the Office for complying with the requirement.

On pages 5 and 6, section entitled "Paragraphs 10 and 11," Applicant argues that "For a 102(b) rejection to be appropriate, Examiner must provide to Applicants where in the reference each and every features of the invention as claimed, for example in Claim 1 being rejected, is specifically illustrated in the prior art being applied." Examiner respectfully disagrees. For a 102(b) to be appropriate, all that is required is that the reference teach each and every claimed feature expressly, implicitly or inherently. There is no requirement that Examiner point out each and every feature for the rejection to be appropriate. All that is required is that the features be taught. Nonetheless, Examiner did specifically point out each and every feature by copying from the Garnier each of the claimed features and pasting them into the Office action of 21 January 2003 and as duplicated above, with the exception of the molecular structure of the polythiophene to which Examiner referred by the formula number in Garnier. The word processing software the Office uses, does not have the capacity to reproduce chemical formulas. Examiner appreciates Applicant's tolerance in this misgiving of the software.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the

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“regioregular” conformation of the polythiophenes) are not recited in the rejected claim(s).

Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Moreover, the regioregular polythiophenes are a non-elected species, as made clear in the notice of non-responsive amendment filed 20 May 2003 (Paper No. 10), and as responded to by Applicant in the amendment filed 29 May 2003 (Paper No. 12) by removing the limitation. Accordingly, the argument is not persuasive.

On pages 7-8, section entitled “Paragraphs 14,” Applicant appears to argue that the US Patent Application Publication of Marks is not appropriately applied because of the publication date. But the Marks US Patent Application Publication qualifies as prior art under 35 USC 102(e). Applicant also appears to argue that Examiner did not provide a basis for the rejection. While not understanding Applicant's confusion, the rejection as stated in the Office action filed 21 January 2003 and as duplicated above, states, “Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Garnier** in view of US Patent Application Publication 2002/0053666 A1 (**Marks et al.**).” This to the best of Examiner's understanding, is the basis for the rejection.

Applicant again bases argument on the regioregularity of the polythiophenes, but this is not claimed and also a non-elected species.

Applicant argues that Examiner did not provide evidence that the references of Garnier and Marks are properly combinable. Examiner respectfully asserts that there exists no such requirement for evidence. Rather only a suggestion to combine the references is required. As stated in the action filed 21 January 2003 and duplicated above, the suggestion to combine is

“**Marks** teaches the benefits of using perfluoroalkyl sidechains from 4 to 12 carbons (paragraph [0057]) on thiophene units in the

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production of polythiophene semiconductor materials to adjust the electron affinity and improve stability and volatility (Abstract).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to make the alkyl sidechains of **Garnier**, perfluoroalkyl sidechains of 4 to 12 carbons, as taught by **Marks**, to achieve the benefits of improved stability and volatility and to be able to adjust the electron affinity.”

The strongest rationale for combining references is a recognition, expressly or impliedly in the prior art or drawn from a convincing line of reasoning based on established scientific principles or legal precedent, that some advantage or expected beneficial result would have been produced by their combination. *In re Sernaker*, 702 F.2d 989, 994-95, 217 USPQ 1, 5-6 (Fed. Cir. 1983). Marks teaches the benefit and, according to precedent, provides “the strongest rationale” to combine the references.

On pages 8-9, section entitled “Paragraphs 15,” Applicant argues that Examiner has not provided evidence that the references of Garnier and Möhwald are properly combinable. Again, evidence is not required. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious for one of ordinary skill in the art, at the time of the invention to use the polythiophene of Möhwald as the semiconductor layer in an electronic device because Garnier teaches that polythiophenes may be used as the semiconductor active layer in a TFT and because Möhwald teaches that the

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polythiophenes have used as semiconductors and are for industrial use. Moreover, it has been held that the selection of a known material based on its suitability for its intended use is *prima facie* obvious --in this case, a known semiconducting polythiophene. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co., Inc. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) (Claims to a printing ink comprising a solvent having the vapor pressure characteristics of butyl carbitol so that the ink would not dry at room temperature but would dry quickly upon heating were held invalid over a reference teaching a printing ink made with a different solvent that was nonvolatile at room temperature but highly volatile when heated in view of an article which taught the desired boiling point and vapor pressure characteristics of a solvent for printing inks and a catalog teaching the boiling point and vapor pressure characteristics of butyl carbitol. "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." 65 USPQ at 301.). See also *In re LESHIN*, 125 USPQ 416 (CCPA 1960) ("Mere selection of known plastics to make container-dispenser of a type made of plastics prior to the invention, the selection of the plastics being on the basis of suitability for the intended use, would be entirely obvious; and in view of 35 U.S.C. 103 it is a wonder that the point is even mentioned.") (See MPEP 2144.07.)

Applicant further argues that Möhwald does not specify the polythiophenes in electronic devices. Examiner respectfully submits that this was not the rationale provided by Examiner. Rather the rejection states,

"While **Möhwald** does not specifically indicate that the polythiophene is in an electronic device, he does indicate that the polythiophene has

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electrical conductivity and may be used as a semiconductor and is for industrial use. (See p. 5, line 20 to p. 6, line 13.)”

Accordingly, given the additional disclosure of Garnier who teaches the use of semiconducting polythiophenes for electronic devices, one of ordinary skill has the express suggestion of Garnier to use semiconducting polythiophenes, such as those disclosed in Möhwald in transistors, as taught by Garnier.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period

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will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication from examiner should be directed to Erik Kielin whose telephone number is (703) 306-5980 and e-mail address is erik.kielin@uspto.gov. The examiner can normally be reached by telephone on Monday through Thursday 9:00 AM until 7:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at (703) 308-4940 or by e-mail at carl.whitehead@uspto.gov. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

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July 14, 2003

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